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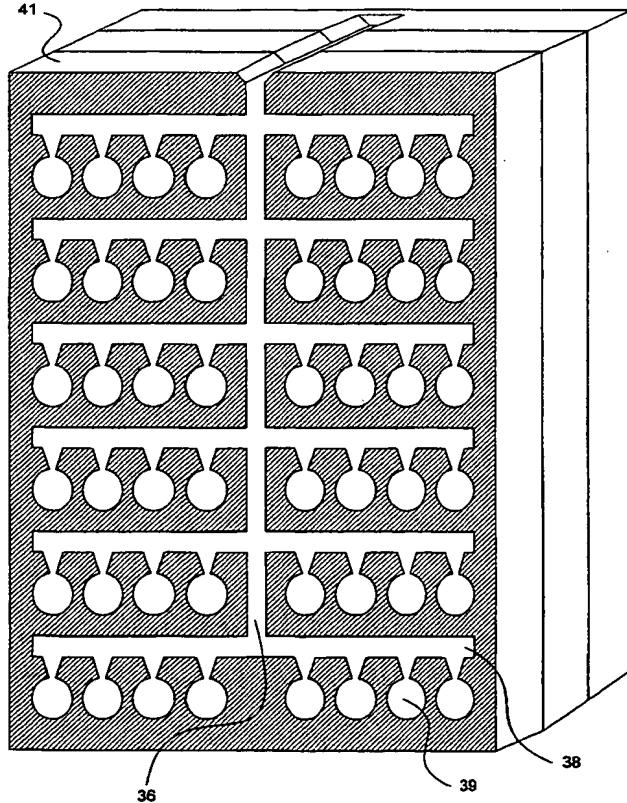
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[Continued on next page]

(54) Title: NITINOL BALL BEARING ELEMENT AND PROCESS FOR MAKING



(57) Abstract: Bearing elements made of Type 60 Nitinol produced by an investment casting process include providing a ceramic mold (30) having a series of spherical cavities, pouring molten Nitinol into the mold cavities, cooling the mold and the Nitinol in the cavities producing solidified Nitinol balls (40), and breaking the mold away from the Nitinol balls. Nitinol rods (80) for roller bearings can be made by conventional casting. The bars are hot machined or hot rotary swaged and then centerless ground in a ball grinding machine (42) and laser cut to length, or are first cut to length and then centerless ground individually for crowned roller elements. The balls are broken or cut from the risers, leaving the gates attached, and are consolidated by heating under pressure in a hot isostatic press (43), then ground to the desired size. The balls or rollers are polished, treated to create an integral ceramic finish and repolished to produce an extremely smooth finish.

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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B21K 1/05
US CL : 29/898.068

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 29/898.068, 898.066, 898.14, 898.13, 898.12; 148/906; 451/49, 50, 242, 243

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

West 2.0

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P ----	US 6,043,451 A (JULIEN et al) 28 March 2000, see entire document.	9, 20 -----
Y, P		5, 18
Y	US 5,393,145 A (IDE) 28 February 1995, see entire document.	1, 3-5, 7, 9-10, 12-18
Y ---	US 4,657,822 A (GOLDSTEIN) 14 April 1987, see entire document.	1, 5 -----
A		2, 6, 8, 19
A	US 4,619,580 A (SNYDER) 28 October 1986, see entire document.	1-20
Y, P	US 5,856,631 A (JULIEN) 05 January 1999, see entire document.	10

 Further documents are listed in the continuation of Box C. See patent family annex.

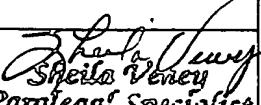
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"A" document defining the general state of the art which is not considered to be of particular relevance		
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed		

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,561,272 A (GOLDSTEIN) 31 December 1985, see entire document.	1, 5
Y	US 5,520,573 A (SUMITA et al) 28 May 1996, see entire document.	3-4, 7, 12 and 18
Y	US 4,507,896 A (SMITH) 02 April 1985, see entire document.	3-4, 7, 12 and 18
Y	US 5,643,051 A (ZHOU et al) 01 July 1997, see entire document.	3-4, 7, 12, and 18
Y, E	US 6,123,605 A (YANO) 26 September 2000, see entire document.	3-4, 7, 12, and 18
Y, P	US 5,928,065 A (SHIH) 27 July 1999, see entire document.	3-4, 7, 12 and 18
Y, P	US 5,913,717 A (TONOOKA et al) 22 June 1999, see entire document.	7, 12-14, and 18
Y, P	US 5,921,851 A (SUZUKI et al) 13 July 1999, see entire document.	7, 12-14 and 18
Y	US 5,791,972 A (MURASUGI et al) 11 August 1998, see entire document.	7, 12-14 and 18